

C l a i m s

1. A method for treatment of untreated injection water (26) for a subsea injection well, in which the injection water (26) may be water from a body of water overlying the well and/or produced water from a well production stream, the method employing an apparatus (10) and a connected water injection pumping equipment that is lowered into said body of water and is connected to the injection well for use under water, and in which water treatment equipment in the apparatus (10) is assembled within at least one module (20), the at least one module (20) containing at least one receptacle (38, 40, 46, 48, 50) and an associated network of lines (34, 44) provided with associated valves (36, 36') through which the water (26) may flow during the water injection, characterized in that the method also comprises the following steps:
- providing the at least one receptacle (38, 40, 46, 48, 50) with at least one type of water-soluble solid-state chemical;
 - bringing the water (26) into contact with the at least one solid-state chemical, causing it to gradually dissolve and mix with the water (26); and
 - leading treated water (26') into an injection stream to the injection well and into an associated reservoir.
2. The method according to claim 1, characterized in providing the at least one receptacle (38, 40, 46, 48, 50) with at least one solid-state unit of the at least one chemical.

3. The method according to claim 2,
c h a r a c t e r i z e d i n providing the at least one
receptacle (38, 40, 46, 48, 50) with at least one solid-
state chemical unit having at least one of the following
5 forms: block, tablet, pill, granule and pellet (42, 52,
54, 56).

4. The method according to claim 1, 2 or 3,
c h a r a c t e r i z e d i n providing the at least one
receptacle (38, 40, 46, 48, 50) with at least one of the
10 following types of solid-state chemicals:

- Chlorine;
- poly-electrolytes;
- iron chloride;
- oxygen scavenger;
- 15 - corrosion inhibitor;
- scale inhibitor; or
- biocide.

5. The method according to claim 1,
c h a r a c t e r i z e d i n arranging one or more
20 receptacles (38, 40, 46, 48, 50) as replaceable
receptacles (38, 40, 46, 48, 50).

6. The method according to claim 5,
c h a r a c t e r i z e d i n arranging one or more
receptacles (38, 40, 46, 48, 50) as replaceable
25 cassettes, cartridges or inserts.

7. The method according to claim 1,
c h a r a c t e r i z e d i n arranging one or more

receptacles (46, 48, 50) for continuous flow of the water (26) across and past the at least one chemical therein.

8. The method according to claim 1,
c h a r a c t e r i z e d i n arranging one or more
5 receptacles (38, 40) for periodical shock-dosing of the
at least one chemical therein.

9. The method according to claim 1,
c h a r a c t e r i z e d i n also connecting the
apparatus (10), via said network of lines (34, 44) and
10 associated valves (36, 36'), to at least one UV-
sterilization receptacle (58, 60) in which at least one
UV-lamp (62) is placed for bactericidal action in water
(26) flowing therethrough.

10. The method according to claim 1 or 9,
15 c h a r a c t e r i z e d i n also connecting the
apparatus (10), via said network of lines (34, 44) and
associated valves (36, 36'), to at least one electro-
chlorination receptacle (64) in which a high-voltage cell
(66) is placed for inhibiting organism growth in water
20 (26) flowing therethrough, inasmuch as electro-
chlorination may be carried out with or without copper-
ion dosing.

11. The method according to claim 1,
c h a r a c t e r i z e d i n arranging the apparatus
25 (10) removably on a foundation (16) on a water bed (12)
in proximity of the subsea well.

12. An apparatus (10) for treatment of untreated injection water (26) for a subsea injection well, in which the injection water (26) may be water from a body of water overlying the well and/or produced water from a well production stream, the apparatus (10) and a water injection pumping equipment connected thereto being disposed, in their position of use, under water in said body of water and in connection with the injection well, and in which water treatment equipment in the apparatus (10) is assembled within at least one module (20), the at least one module (20) containing at least one receptacle (38, 40, 46, 48, 50) and an associated network of lines (34, 44) provided with associated valves (36, 36') through which the water (26) may flow during the water injection, characterized in that the at least one receptacle (38, 40, 46, 48, 50) contains at least one type of water-soluble solid-state chemical for treatment of the water (26), the at least one chemical dissolving gradually upon contact with the water (26) and mixing with the water (26), after which treated water (26') may be pumped into the injection well and into an associated reservoir.

13. The apparatus (10) according to claim 12, characterized in that the at least one chemical exists as at least one solid-state unit.

14. The apparatus (10) according to claim 13, characterized in that the at least one solid-state chemical exists in at least one of the following forms: block, tablet, pill, granule and pellet (42, 52, 54, 56).

15. The apparatus (10) according to claim 12, 13 or 14, characterized in that the solid-state chemical is at least one of the following types of chemicals:

- 5 - Chlorine;
- poly-electrolytes;
- iron chloride;
- oxygen scavenger;
- corrosion inhibitor;
- 10 - scale inhibitor; or
- biocide.

16. The apparatus (10) according to claim 12, characterized in that one or more receptacles (38, 40, 46, 48, 50) are replaceable.

15 17. The apparatus (10) according to claim 16, characterized in that one or more receptacles (38, 40, 46, 48, 50) are replaceable cassettes, cartridges or inserts.

18. The apparatus (10) according to claim 12, characterized in that one or more
20 receptacles (46, 48, 50) are arranged for continuous flow of the water (26) across and past the at least one chemical therein.

19. The apparatus (10) according to claim 12, characterized in that one or more
25 receptacles (38, 40) are arranged for periodical shock-dosing of the at least one chemical therein.

20. The apparatus (10) according to claim 12,
c h a r a c t e r i z e d i n that the apparatus (10)
also is connected, via said network of lines (34, 44) and
associated valves (36, 36'), to at least one UV-
sterilization receptacle (58, 60) in which at least one
UV-lamp (62) is placed for bactericidal action in water
(26) flowing therethrough.

21. The apparatus (10) according to claim 12 or 20,
c h a r a c t e r i z e d i n that the apparatus (10)
also is connected, via said network of lines (34, 44) and
associated valves (36, 36'), to at least one electro-
chlorination receptacle (64) in which a high-voltage cell
(66) is placed for inhibiting organism growth in water
(26) flowing therethrough, inasmuch as electro-
chlorination may be carried out with or without copper-
ion dosing.

22. The apparatus (10) according to claim 12,
c h a r a c t e r i z e d i n that the apparatus (10) is
removably connected to a foundation (16) on a water bed
(12) in proximity of the subsea well.